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United States Patent [19]

Shen et al.

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[54] **LOW COST ROOM TEMPERATURE
ELECTROCHEMICAL CARBON MONOXIDE
AND TOXIC GAS SENSOR WITH HUMIDITY
COMPENSATION BASED ON PROTONIC
CONDUCTIVE MEMBRANES**

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[*] Notice: The term of this patent shall not extend
beyond the expiration date of Pat. No.
5,573,648.

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Related U.S. Application Data

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205/781; 205/783.5; 205/784; 205/786.5;
205/788**

[58] Field of Search **204/412, 421-429;
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[57] ABSTRACT

A low cost room temperature electrochemical gas sensor with humidity compensation for sensing CO, alcohol vapors and other toxic analyte gases has a solid protonic conductive membrane with a low bulk ionic resistance. A sensing electrode and a counter electrode, optionally a counter electrode and a reference electrode, which are separated by the membrane, can be made of mixed protonic-electronic conductors, or can be made of a thin electrically conducting film such as platinum. A reservoir of water maintain the solid protonic conductive membrane at constant 100 percent relative humidity to compensate for ambient humidity changes. Embodiments of the inventive sensor also include an electrochemical analyte gas pump to transport the analyte gas away from the counter electrode side of the sensor. Analyte gas pumps for the inventive sensor include dual pumping electrodes situated on opposite sides of the membrane, and include a means for applying a DC power across the membrane to the sensing and counter electrodes. Another embodiment of the inventive sensor has first and second solid protonic conductive membranes, one of which has a sensing electrode and a counter electrode separated by the first membrane, and the other of which has dual pump electrodes situated on opposite sides of the second membrane.

65 Claims, 6 Drawing Sheets